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January 8, 2010

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PUBLIC UTILITIES COMMISSION
FILED

The Honorable Chairman and Members
of the Hawaii Public Utilities Commission
Kekuanaoa Building, First Floor
465 South King Street
Honolulu, Hawaii 96813

Dear Commissioners:

Subject: Docket No. 2008-0083 – Hawaiian Electric 2009 Test Year Rate Case
Hawaiian Electric's Responses to Commission Information Requests

Enclosed for filing are Hawaiian Electric Company, Inc.'s ("Hawaiian Electric") responses to the information requests ("IRs") issued by the Commission to Hawaiian Electric on January 6, 2010: PUC-IR-192 and -193.[1]

Very truly yours,

Enclosures

cc: Division of Consumer Advocacy
Michael L. Brosch, Utilitech, Inc.
Joseph A. Herz, Sawvel & Associates, Inc.
Dr. Kay Davoodi, Department of Defense
James N. McCormick, Department of Defense
Theodore E. Vestal, Department of Defense
Ralph Smith, Larkin & Associates

[1] The IRs issued by the Commission on January 6th were numbered as PUC-IR-190 and PUC-IR-191. For reference purposes, Hawaiian Electric has renumbered them as PUC-IR-192 and PUC-IR-193 to follow in sequential order from the IRs previously submitted by the Commission.

PUC-IR-192

If the commission were to authorize the use of CT-1 by HECO at this time, would there be a need to operate CT-1 as a peaking unit now or in the near future? Please explain.

Hawaiian Electric Response:

Yes, there would be a need to operate CT-1 as a peaking unit if the Commission were to authorize the use of CT-1 by Hawaiian Electric at this time. First, please refer to Hawaiian Electric's response to PUC-IR-117, Attachment 2, in the instant docket. The results of a generating system reliability analysis[1] indicated that based on the (1) September 2008 peak demand forecast and (2) recorded peaks in 2009, which closely follow the monthly forecast peaks in the September 2008 forecast for the May to August 2009 timeframe,[2] the reserve capacity shortfall would be 60 MW in 2009 in the Reference Scenario without CT-1, and the reserve capacity shortfall would range from 40 MW to 80 MW in the period 2010 to 2014 without CT-1.

Second, please refer to Hawaiian Electric's response to PUC-IR-117, pages 13 to 15 regarding the emergency use of CT-1. As indicated in the response, Hawaiian Electric submitted a proposal to the Commission and the Consumer Advocate by letter dated September 16, 2009, in order to identify the limited, emergency circumstances under which CT-1 would be operated at this time (for the purpose of serving load). The proposal was developed in recognition that natural disasters and other catastrophic events could impact the Company's electric system at any time, and that preparation and planning for emergencies are necessary to fulfill its

[1] Shown in Table 8A, on page 2 of Attachment 2 in the Company's response to PUC-IR-117.
[2] Shown on the table on page 3 of Attachment 2 in the Company's response to PUC-IR-117. Please also refer to the *Declaration of Ross H. Sakuda*, filed in this docket on November 19, 2009 with *Hawaiian Electric Company, Inc.'s Motion for Second Interim Increase for CIP CT-1 Revenue Requirements, or in the Alternative, to Continue Accruing AFUDC for the CIP CT-1 Project*. The declaration provides additional information for October 2009.

commitment to provide reliable service to its customers. Based on its review, the Consumer Advocate notified the Commission and Hawaiian Electric by letter dated September 30, 2009 that it does not object to Hawaiian Electric's request to utilize CT-1 on a limited basis under the emergency conditions, provided that the Commission and the Consumer Advocate are notified of such use during Gen Con 1, 2, 3, or 4. Hawaiian Electric has been informed by the Commission that case-by-case approvals for emergency use of CT-1 are not required. (The Company is required to submit written notification to the Commission and the Consumer Advocate within three days after CT-1 is used for the emergency purposes described in the previous paragraphs; i.e., when the system is in Gen Con 1, 2, 3 or 4 situations.) On October 9, 2009, CT-1 was operated for emergency purposes, i.e., there was a shortfall of spinning reserve. On October 12, 2009, Hawaiian Electric submitted a letter informing the Commission of the use of CT-1 for emergency purposes and the reasons for its use. There may be similar circumstances "now or in the near future" under which CT-1 would be used again. If the Commission were to authorize the use of CT-1 by Hawaiian Electric at this time, Hawaiian Electric would be able to use CT-1 under these types of circumstances without being subject to the conditions described in its September 16, 2009 proposal described above.

Third, for the purposes of determining avoided energy costs in accordance with the Updated Stipulation to Resolve Proceeding in Docket No. 7310 ("Updated Stipulation"), which was approved by the Commission on March 11, 2008, in Decision and Order No. 24086, Hawaiian Electric performed production simulations covering calendar year 2010, with and without a 1 MW block of generation. The preliminary results, which assumed for the purpose of the run that CT-1 would be available for the entire year on biodiesel, were issued to the parties and recipients in Docket No. 7310 on October 1, 2009. Exhibit J, page 4, of the transmittal to the

parties and recipients, provided the estimated run hours of the generating units on the system. In the production simulation without the 1 MW block (QF[3]-out or Base Case), CT-1 (noted as CIP1 in the file) was projected to operate for about 559 hours during the on-peak periods.[4] In the QF-in case, CT-1 was projected to operate for about 552 hours during the on-peak periods. In the final production simulations, performed in December 2009 and to apply to calendar year 2009, to determine avoided costs in accordance with the Updated Stipulation, CT-1 was assumed not to be available for use on biodiesel until October 1, 2010. In the QF-out and QF-in cases, CT-1 operating hours were about 147 and 145 hours, respectively.

[3] Qualifying Facility.
[4] The number of hours of CT-1 operation in the off-peak periods for both the QF-in and QF-out cases were not significant.

PUC-IR-193

Please identify the benefits of utilizing CT-1 as a peaking unit, including any cost savings, to ratepayers through such use. To the extent possible, please quantify the benefits.

Hawaiian Electric Response:

CT-1 is a conventional generating unit that is dispatchable.[1] Mr. Dan Giovanni describes conventional generation in HECO T-7, page 15, of his testimony. He also describes dispatchability of conventional generation in HECO T-7, page 14, of his testimony. Mr. Giovanni states in HECO T-7, page 15, line 16, to page 16, line 6:

> Having conventional generation operating on the grid is critical when integrating intermittent renewable energy resources (also referred to as "variable generation"), such as wind farms into the grid. As discussed in greater detail below in my testimony, to be able to quickly offset the changes in wind farm output, it is necessary to have regulating reserve on-line such that total generation can be ramped either up or down to cover the potential variation in wind farm output. When the outputs of the as-available units increase, the outputs of the firm units must be decreased through automatic dispatch so that supply and demand can remain balanced. Similarly, when the outputs of as-available units decrease, the outputs of the firm units must be increased. The larger the total amount of wind farms that are on-line, the larger the potential variation in wind farm output and the larger the required amount of regulating reserves. If system demand is increasing or decreasing as as-available unit output is increasing or decreasing, dispatch decisions must then take the two simultaneous actions into account in dispatching the firm generating units. Therefore, having fully dispatchable units is critical in maintaining a stable grid.

Mr. Giovanni further states in HECO T-7, page 24, line 18, to page 25, line 2:

> Power systems require that the generation resources on the system collectively provide several characteristics that the system fundamentally needs for reliable operation. These characteristics include adequate firm generating capacity,

[1] The Covered Source Permit for CT-1 places constraints on the dispatchability of CT-1. For example, CT-1 is intended to provide spinning reserve by being on-line and dispatched within 10 MW of the minimum operating load. The unit may be dispatched at higher loads only when the steam units are not reasonably able to serve system needs. Although the Commission's question refers to CT-1 specifically as a peaking unit, and Hawaiian Electric plans to operate CT-1 as a peaking unit to provide energy and spinning reserve during day or evening peak periods, there may be circumstances under which the unit may be operated for longer periods. For example, pursuant to the discussion in this response, the unit may need to be called upon for longer periods to help provide frequency regulation as more as-available generation is integrated into the grid.

> controlled dispatch of generation, frequency regulation, and sufficient rotational inertia to maintain system stability. Baseload, cycling, and peaking generating units are commonly referred to as "firm" power, and their power output can be dispatched as needed. As-available resources like wind and PV are not firm, can not be dispatched, and are unable to provide prescribed amounts of power upon command or at scheduled times.

Mr. Giovanni discusses firm capacity, dispatchability, frequency regulation, and rotational inertia in HECO T-7, on pages 25 to 27 and HECO ST-7, pages 15-18. He concludes in HECO T-7, page 27, lines 8 to 11:

> Ultimately, the addition of new firm generating units on the grid that have flexible characteristics like quick starting and fast ramping capabilities, like HECO's CIP CT-1, will further support the integration of intermittent as-available renewable generation on the HECO system.

In HECO ST-7, on pages 14 to 21, Mr. Giovanni explains the operational value of CT-1. He states on page 15:

> CIP CT-1 provides significant value in three general ways: (1) allows Hawaiian Electric to more effectively integrate increasing levels of renewable variable generation resources (such as wind and solar electric energy) into the Oahu grid; (2) eliminates the need to commit up to two other cycling and/or peaking units to provide 30 to 50 MW of generation and 60 to 80 MW of spinning reserve (and achieved firing biodiesel, and not fossil fuel, thus reducing the "carbon footprint" of the generating system); and (3) delivers on Hawaiian Electric's fundamental "obligation to serve" by maintaining an appropriate and responsible level of firm generating capacity on Oahu.

These capabilities described above are available today if the Commission were to authorize the use of CT-1 by Hawaiian Electric at this time.[2] Mr. Giovanni further states in HECO ST-7, on page 15, lines 13 to 25:

> Power systems require that the generation resources on the system collectively provide several characteristics that the system fundamentally needs for reliable operation. These characteristics include adequate firm generating capacity, voltage regulation, dispatchable generation, frequency regulation, and sufficient rotational inertia to maintain system stability. Baseload, cycling, and peaking generating units are commonly referred to as "firm" power, and their power

[2] Hearing Transcripts Tr. (Vol. II) at 379-382 (Giovanni).

output can be dispatched as needed. Variable generation resources like wind and PV are not firm, can not be dispatched, and are unable to provide prescribed amounts of power upon command or at scheduled times. Firm power sources, like CIP CT-1, have important operational characteristics that facilitate and support the integration of variable generation resources. Safe and reliable operation of the system is not possible without these firm power sources. These important operational characteristics are further discussed below.

In HECO ST-7, page 19, lines 7 to 21, Mr. Giovanni stated:

> CIP CT-1 is a firm power generating unit with dynamic characteristics that exceed those of Hawaiian Electric's other existing firm power generating units. In particular, CIP CT-1 may be started and connected to the grid in minutes (compared to hours for the steam units), and it may dispatched at ramp rates (up and down) that are up to 10 times greater than those for the steam units. For example, CIP CT-1 has a ramp rate of 13.4 MW, while the Company's steam units have ramp rates that range from 1 to 4 MW. Similarly, the largest generating unit on the Company's system, the coal-fired generating unit at the AES facility, also has limited ramping capability. There will be times during off-peak periods when the cycling units are off-line and the ramping capability of CIP CT-1 will be needed as the on-line steam units will not be able to provide the needed ramping to counter balance the unpredictable power from variable generation. Ultimately, the addition of new firm generating units on Oahu grid that have flexible characteristics like CIP CT-1 will further support the integration of renewable variable generation on the Hawaiian Electric system.

In HECO ST-7, page 20, lines 12 to 21, Mr. Giovanni stated:

> CIP CT-1 would help reduce the "carbon footprint" of the Company's generating system because it would operate on biofuels and not fossil fuels. Burning biodiesel will reduce greenhouse gas emissions. CIP CT-1 will be utilized most often to provide spinning reserve for the Oahu grid, and thus, would displace the generation otherwise provided by the Company's fossil fuel-fired cycling and peaking units. CIP CT-1 would be dispatched at 30 to 50 MW and provide up to 80 MW of spinning reserve. If not for CIP CT-1, Hawaiian Electric would have to dispatch two or three of its cycling steam units (Waiau 3, 4, 5 and 6, and Honolulu 8 and 9), or both of its peaking units (i.e., Waiau 9 and 10) to achieve similar levels of spinning reserve.

In HECO ST-7, page 20, line 24 to page 21, line 11, Mr. Giovanni stated:

> CIP CT-1 is needed to give Hawaiian Electric the opportunity to fulfill its obligation to serve – to provide reliable electric power to its customers when they demand it. Hawaiian Electric has analyzed system reliability results under a range of possible energy futures, including two sensitivity scenarios based on a

recent (and lower) September 2008 Short Term Sales & Peak forecast. Hawaiian Electric projects that in the years 2011, 2012, 2013, and 2014, there could be a reserve capacity of 40 MW, 10 MW, 20 MW and 20 MW, respectively (as shown in the reference scenario of the 2009 Adequacy of Supply ("AOS") Report filed February 27, 2009) with the benefit of the 110 MW of capacity from CIP CT-1. Under some scenarios there is also the potential for a reserve capacity shortfall of up to 50 MW (as shown in the 2009 AOS (higher load) scenario) even with CIP CT-1 on line. The ranges are broad, and indicate the degree to which key planning assumptions such as the peak demand forecast can quickly and unexpectedly change over time.

Hawaiian Electric anticipates that a significant amount of variable generation will be integrated onto its grid in the near future. For example, on August 5, 2009, Hawaiian Electric submitted an application in Docket No. 2009-0176 for Commission approval of a power purchase agreement ("PPA") between Hawaiian Electric and Kahuku Wind Power, LLC, ("Kahuku Power") for a 30 MW wind farm on the north shore of Oahu. As indicated in the application, Kahuku Power is required to operate its wind farm and offer energy to Hawaiian Electric by the Guaranteed Commercial Operation Date ("GCOD") of December 31, 2010. If the GCOD deadline is not attained, Kahuku Power will have an applicable grace period to achieve the Commercial Operation Date (as defined in the PPA).

In addition, on December 1, 2009, Hawaiian Electric and Honua Power, LLC, ("Honua") executed a power purchase contract ("PPC") for Honua to provide approximately 6 MW of as-available energy to Hawaiian Electric.

Furthermore, a significant amount of as-available generation may be added to the Hawaiian Electric grid under Feed-In Tariffs, which are being established in Docket No. 2008-0273. The guaranteed commercial operation date is 30 months following the earlier of the Waiver Agreement Date or Non-Appealable PUC Approval Order Date, which are defined in the PPC.

Hawaiian Electric's response to PUC-IR-155, submitted on October 19, 2009, is applicable to PUC-IR-193 today, and states:

> As described in HECO ST-7, page 14 to 21, CIP CT-1 provides significant operational value in three general ways:
> 1) allows Hawaiian Electric to more effectively integrate increasing levels of renewable variable generation resources (such as wind and solar electric energy) into the Oahu grid;
> 2) eliminates the need to commit up to two other cycling and/or peaking units to provide 30 to 50 MW of generation and 60 to 80 MW of spinning reserve (and achieved firing biodiesel, and not fossil fuel, thus reducing the "carbon footprint" of the generating system); and
> 3) delivers on Hawaiian Electric's fundamental "obligation to serve" by maintaining an appropriate and responsible level of firm generating capacity on Oahu.
>
> HECO ST-7 also describes operational characteristics provided by CIP CT-1 that facilitate and support the integration of variable generation resources.

With respect to the quantification of benefits and cost savings, CIP CT-1 is more efficient than Waiau Units 9 and 10 ("W9 and W10"), which are also peaking units. For example, the heat rate of CIP CT-1 at its normal top load rating of 113 MW-net is about 11,720 Btu/kWh-net. By comparison, the heat rate of W9 at its normal top load rating of about 53 MW-net is about 13,150 Btu/kWh-net, and the heat rate of W10 at its normal top load rating of about 50 MW-net is about 12,530 Btu/kWh-net. The heat rate of CT-1 at its minimum load rating of approximately 40 MW-net is about 16,800 Btu/kWh-net. By comparison, the heat rate of W9 and W10 at their minimum load rating of approximately 6 MW-net is about 41,140 and 39,350 Btu/kWh-net, respectively.

While CIP CT-1 is more efficient than W9 and W10, it will use biodiesel, which is currently more expensive than diesel fuel, which W9 and W10 use. For example, in the determination of fuel oil expense in the instant docket, biodiesel was priced at approximately

$150 per barrel or $30.01 per million Btu ("MBtu") and diesel fuel was priced at approximately $85 per barrel or $14.50 per MBtu.[3]

Table 1 below provides a comparison of fuel costs, on a cents per kWh basis, for CIP CT-1 and for W9 and W10, at different load points. The fuel cost in cents per kWh is determined by multiplying the heat rate, in Btu/kWh-net, at a given load point by the fuel price, in cents per MBtu. The heat rates in the table were determined by using the heat rate constants in HECO WP-406, page 2. It can be seen that while CIP CT-1 is more thermally efficient as explained above, its unit energy cost, in terms of cents per kWh, is higher than that of W9 or W10.

Table 1

Output, MW-net	W9		W10		CT-1	
	Heat Rate, Btu/kWh-net	Fuel Cost, ¢/kWh	Heat Rate, Btu/kWh-net	Fuel Cost, ¢/kWh	Heat Rate, Btu/kWh-net	Fuel Cost, ¢/kWh
6	41,140	59.7	39,350	57.1		
25	16,530	24.0	15,640	22.7		
40	13,990	20.3	13,200	19.1	16,800	50.4
50	13,280	19.3	12,530	18.2	15,220	45.7
53	13,150	19.1			14,860	44.6
75					13,120	39.4
100					12,080	36.3
113					11,720	35.2

While CIP CT-1 is more expensive to operate in terms of its unit energy cost, the operation of CIP CT-1 on biodiesel will reduce the amount of fossil fuel consumed in Hawaii and will also reduce the carbon footprint of generating electricity. For every 100 MWh produced by CIP CT-1 using biodiesel (i.e., CIP CT-1 operating at 100 MW for one hour) instead of from

[3] The prices provided here are approximate and are used for illustrative purposes. The actual fuel prices used in the April 2009 Update for settlement purposes are provided in HECO T-5, Attachment 1, page 2, April 2009 Update, Final Settlement, under protective order.

W9 or W10 using diesel (i.e., W9 and W10 each operating at 50 MW for one hour), approximately 220 barrels (equivalent to 9,240 gallons) of fossil fuel oil would not be burned in Hawaii.